

## THE NOTION OF BALANCE EVOLUTION IN THE NATURAL RESOURCE MANAGEMENT

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*Poor elaboration of sustainable development methodologies makes the problem of the said idea conceptual-categorical framework specification topical. The aim of the research is the determination of evolutionary changes and “balance” notion in the natural resource management, and its specification for the conditions of sustainable development. It has been stated that at the earlier stages balance was related to the need for natural resources conservation. Since the middle of the XX century in the conditions of environmental pollution and degradation, the requirement to substantiate ecological restrictions under economic growth has developed. The answer to the stated requirement was found in the development of a biosphere concept limiting anthropogenic impact on the environment up to 1% biota net primary production consumption, ensuring ecological-economic balance at natural resource management which provides for well-balanced correlation of various territory uses and maintenance of balanced state of the flow of matter and energy, discovery of the biosphere-technosphere threshold which reflects a balance between the technosphere environmental capacity and the territory environmental technogenic capacity, the determination of the threshold provides for the use of the energy approach. A new stage in balance substantiation is connected to a sustainable development concept aimed at reaching a balance between social and economic problems solution and environmental preservation; the concept is also aimed at uninterrupted unity of economy, ecology, and social justice which reflects in a balance between the goals of ecological, economic, and social subsystems. Economic concepts based on the use of social-economic and geocosocioeconomic approaches show their own approach to balance.*

**Key words:** *balance; concepts; approaches; natural science researches; economic researches; approximation.*

The analysis shows that the notion of balance in the natural resource management hasn't got any unique interpretation. Balance was originally considered in respect of the natural resources use and restoration which had a direct relationship to the idea of forest management aimed at excessive forest resources depletion prevention by means of their natural restoration. Hanz Carl von Carlowitz was the founder of the concept being the first one to formulate the concept of sustainability in his book “Silviculture and Economics” (1713). [1, p. 198]. Appearance of the book was connected with the problem of forest resources scarcity some European countries faced in the middle of the XVII century, and the need to create conditions for uninterrupted forest utilization (sustainable yield forestry). In the following years over a long period of time forestry researches were aimed at the substantiation of the most acceptable forms of growth and falling priority to ensure uninterrupted and sustainable forest utilization.

Acknowledgement of environmental protection significance in the middle of the XX century conditioned on the appearance of an environmental optimization concept; the author of the work [2, p. 24] reduces the sense of the concept to a “well-balanced

relation between the exploitation, conservation, and melioration". A. G. Isachenko considers environmental optimization from the position of "nature – society" relations optimization and believes that it is necessary to supplement efficiently controlled exchange between society and nature which provides for natural resources exploitation and protection with the third element – melioration (active involvement of people into natural processes in order to improve and enrich the environment). The term "optimization", in this case, and to the author's perspective, according to the content put into it is rather close to the notion of "sustainable (correct) natural resource management", the definition of the basic principles of which in national science is associated with the works by D. L. Armand [3].

With a certain degree of conditionality a similar characteristic of well-balanced natural resource management distinguishes works [4–6], where under natural resource management balance the authors understand that consumption rates of natural resources which are balanced by "the nature's possibility of restoring not only the quality of the environment, but also some renewable constituents of the resources" [4, p. 5]. Under further specification of a well-balanced natural resource management law, it is supplemented with a corrective addition, namely, taking into account assimilative capacity of a certain region within the framework of which the conditions of natural resource management balance are implemented [5, p. 264]. At that, the authors are not aimed at describing the mechanism of calculating assimilative capacity, they describe its value when constructing the nomograms of relationship between economic growth rates and natural resources and environmental quality restoration rates.

In the middle of the XX century natural resource management balance was officially defined as a possibility for economic growth within the framework of acceptable ecological-economic balance. Stating the essence of the eco-development concept M. Strong, the Secretary-General of the 1972 Stockholm Conference, announced requisitions for balance as a "balance between anthropogenic impact on the environment and its renewable and self-rectifying capacity with its endurance in relation to these impacts" [7]. Search for the criteria, environmental restrictions ensuring the fulfillment of ecological-economic balance (requisition for balance), led to the formation of a range of research directions, among which biosphere concept should be considered which recognizes the idea of "biological stabilization of the environment".

With the active development of biotic regulation idea initiated by V. I. Vernadskii and N. V. Timofeev-Resovskii, V. G. Gorshkov proved that biota is the only mechanism providing conditions required for life existence. Biotic regulation mechanism acknowledgement provided the possibility of stating an acceptable threshold of biota net primary production (NPP). On the assumption that 90% of vegetational organic (NPP) is consumed by mushrooms, bacteria, and unicellular organisms, more than 9% is consumed by small invertebrates, consumption of vegetational organic by vertebrates including human is valued at 1% [8, 9]. The same result was obtained by a group of American ecologists directed by P. M. Vitousek [10].

At the earlier stages of human development, consumption was limited by 1–2% of biotic energy which corresponded to the level of balance, i. e. nature resource management complying with an accepted "biosphere corridor" [11–13]. In modern conditions the accepted "threshold" is exceeded by at least 10 times which leads to life destabilization on the Earth. Special hazard exposes the reduction of territories covered with uninterrupted biota. Biotic regulation potential violation and, correspondingly, environmental sustainability decrease, in this case, are verse results manifestation. From all has been said follows the priority of maintaining and restoring natural ecosystems (represented mainly by biota forest communities) to the extent sufficient for environmental regulation and stabilization [14].

Undisturbed natural ecosystems preservation relevance has predetermined the need for stating critical correlations between the territories developed and reorganized by human and territories occupied by undisturbed biota. In this case natural resource management balance provides for a possibility of replacing natural ecosystems (landscapes) by artificial ones in the process of natural resources use only within the limits of biosphere carrying ecological (economic) capacity which does not violate the mechanism of biotic regulation and prevents the threat of global ecological crisis. The point at issue is a correct territory organization, ecological-economic balance of the territory (EEB), which in B. I. Kochurov's definition represents "well-balanced correlation of various types of territory use and maintenance of balanced state of the flow of matter and energy providing landscapes sustainability and restoration of natural (renewable) resources without causing negative ecological changes in nature" [15]. Meeting the requirements of EEB testifies to a well-balanced development including well-balanced natural resource management.

It is assumed that the correlation between disturbed and undisturbed territories in Russia is better than that of the worldwide average level but requires improvement in terms of reducing disturbed land areas (first of all, areas with totally disturbed ecosystems) and increasing areas with natural undisturbed biota. According to the registration data in 1993, forest area in Russia was 51.8% of total land area, nature reserves – 1.5%, and wildlife sanctuaries – 2.7%. Taking into account that undisturbed forests occupy 71.8% of forested area then territories with undisturbed biota occupied 41.39%.

With the account of existing tendencies in forest management and specially protected natural areas (OOPT) creation, significant increase in the rate of the territories with undisturbed natural ecosystems is not awaited.

According to FAO of the UN's recommendations, forests should occupy 50% of the Earth's surface, farmlands – 45%, and built-up areas – 5%. K. Doxiadis' recommendations are close to the indicated correlation, in accordance with them all dry land of the planet has been divided into 12 types of zones which allowed obtaining the following correlation: undisturbed territories – 57%, reorganized territories – 40%, urban land – 3% [16, p. 92]. E. Odum also comes to the conclusion that one third of total human society habitat should make up ... various protected areas of spontaneous nature [17]. In work [18] the advised percentage of territories for ecological balance preservation is defined as 50%. At that the authors of [19], apart from OOPT, consider the introduction of the reserved areas of historical-cultural heritage and traditional nature resource management, together with the land used for nature protection and reserved areas used for resource purposes into the undisturbed systems ecological network possible. As discussed in work [11, p. 281], academician A. D. Sakharov believed that "in the future, the division of dry surface into settled land and unsettled territory at the ratio of 3 : 8 is necessary" which closely corresponds to the results coming from the theory of biotic regulation of the environment. The authors [20, 21] think that the area of utilized forests should be reduced by 30% which will make it possible to enlarge the territory of undisturbed natural ecosystems, along with that it is advisable to stop the scaled-up utilization of the World Ocean.

Researches of the end of the XX century were accorded wide recognition, substantiating balance between the technosphere environmental capacity –  $U$  and the territory environmental technogenic capacity –  $T$ . In accordance with [22–24], the criterion of balance herewith means preventing the excess of technogenic load over the environmental technogenic capacity which reflects renewable potential of the territory's natural system. If balance is reached, when  $U = T$ , manufacturing is performed without violation of assimilative capacity of the territory being compatible with nominally

favorable environmental conditions. Environmental technogenic capacity of the territory, in this case, is considered as maximum safe technogenic load (biosphere-technosphere threshold), ecological restriction of economic growth.

The considered criterion of balance is commonly used with respect to the environmental pollution and the assimilative capacity possibility of assimilating contaminants entering the atmosphere, soil, and water sources, at that, "environmental technogenic capacity of the territory constitutes only a part of the territory's total ecological capacity" [22, p. 337]. In making comparative assessments energy approach is recommended. It is the energy approach researches commonly refer to when assessing balance rate and, thereafter, the territory's environmental condition stress level [25, 26]. The interpretation of the acquired results is also possible from the point of view of environmental safety of industry anthropogenic impact on the environment including nature resource management. It follows from the analysis that all the indicated definitions of balance characterize it from the point of view of the natural science approach with an assessing focus on the energy measuring instruments.

A new stage in balance substantiation was introduced by the conference "Rio+20" (Rio de Janeiro Summit in 1992), where the global community appealed for transferring to a new ecological-economic development model. As compared to the eco-development model, sustainable development admits the social aspect equality. The World Commission on Environment and Development interpret sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" [27]. In the outcomes of the "Rio+20" conference sustainable development is defined as combining steady improvement of economic and social living conditions and long-term preservation of the life's natural fundamentals.

The concept of the Russian Federation transfer to sustainable development (1996) assumes that sustainable development will ensure "interconnected, internally well-balanced functioning of the triad – nature, population, and economy" [11, p. 393], O. I. Sergienko considers sustainable development as "well-balanced functioning of three components: quality of the environment, living standard, and economic development" [28, p. 32]. Author [29] believes that sustainable development provides for a balance between social-economic problems solution and environmental protection, meeting the vital requirements of the present generation and meeting the needs of the future generations. Defining sustainable development a range of works, taking into account indissoluble unity of ecology, economy, and social justice, consider these three aspects with reference to each other from the point of view of their objectives balance. In practice, it is either integration of social, ecological, and economic aspect, or the use of the system of indices reflecting separate aspects of sustainable development that are recommended for sustainability assessment [30]. At that, the issue of balance is not discussed as initially according to the definition of the English-Russian dictionary [31], sustainable development is characterized as well-balanced, self-sustaining, and self-sufficient, i.e. the level of sustainability is characterized by a balance between all three aspects under consideration.

Balance is also defined in the context of economic concepts. Like that, social-economic approach offered by authors [32–34] tolerates the maximization of economic gain only "in case of social standards are met and ecological balance is kept", i. e. the use of natural resources is expected within the limits of social and ecological restrictions [34, p. 16]. For comparison purposes the methodology of social-economic approach requires the expression of social and ecological consequences in monetary indicators and appeal to multi-criteria assessment which provides for the equality of social ecological and economic objectives.

Social-ecological approach develops into the further ecologization and geocosocioeconomic approach methodological ideas development [35, 36], formed as a result of social-economic and geoecological approaches approximation. It is assumed that the given approach provides for harmonization of economic, social, and ecological subsystems' goals, establishing balance between an economic result (effect) and economic damage conditioned on ecological and social consequences.

There is no escaping another aspect of balance definition which is a balance between the interests of enterprises (natural resource users) exploiting natural-resources potential and the interests of the population of a certain territory with regard to its social-economic development and environmental protection. Special role in interests harmonization at natural resource management belongs to the state intended to ensure social and economic stability, determine the strategy for the economic growth, as well as to the institutions of local government in oblast, autonomous district, city, and region, and to non-governmental organizations.

So, balance definition is not constant within the time aspect. Natural science researches are the most elaborate. After "Rio+20" conference economic concepts develop, reflecting social constituent. Definite approximation of natural science and economic investigations is typical for the modern stage which provides for the elaboration of a single integrated approach to the definition of balance and allows hoping for a positive solution of sustainable development problem.

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## ЭВОЛЮЦИЯ ПОНЯТИЯ СБАЛАНСИРОВАННОСТИ В ПРИРОДОПОЛЬЗОВАНИИ

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Недостаточная разработка методологий устойчивого развития актуализирует проблему уточнения понятийно-категорийного аппарата этой концепции. Цель исследования – выявление эволюционных изменений, понятия «сбалансированность» в природопользовании и его уточнение для условий экоустойчивого развития. Установлено, что на ранних этапах сбалансированность увязывалась с необходимостью предотвращения истощения природных ресурсов. С середины XX века в услови-

ях загрязнения окружающей среды и ухудшения экологической ситуации формируется требование обоснования экологических ограничений при экономическом росте. Ответом на сформулированное требование явилась разработка биосферной концепции, ограничивающей антропогенное воздействие на природную среду 1 % потребления чистой первичной продукции биоты; обеспечение эколого-экономического баланса при природопользовании, предполагающего сбалансированное соотношение различных видов использования территорий и поддержание равновесного состояния потоков вещества и энергии; выявление биосферно-техносферного порога, отражающего сбалансированность природоемкости техносферы и экологической техноёмкости территории, установление которого предусматривает использование энергетического подхода. Новый виток в обосновании сбалансированности связан с концепцией устойчивого развития, ориентированной на баланс в решении социально-экономических проблем и сохранение окружающей среды, на непрерывное единство экономики, экологии и социальной справедливости, что находит отражение в сбалансированности целевых установок экологической, экономической и социальной подсистем. Свой подход к сбалансированности демонстрируют и экономические концепции, базирующиеся на использовании социально-экономического и геозосоциоэкономического подходов.

**Ключевые слова:** сбалансированность; концепции; подходы; естественнонаучные исследования; экономические исследования; сближение.

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